

UNITED STATES GOVERNMENT
MEMORANDUM

Date: September 22, 2011

Reply to

Attn of: Ronald G. Fay

Subject: Mojave Water Agency Groundwater / Water-Quality training and field review
September 8 & 9, 2011.

To: The record

As part of a cooperative agreement between the U.S. Geological Survey (USGS) and the Mojave Water Agency (MWA), MWA groundwater data are stored in the USGS National Water Information System (NWIS) database. The USGS requires that the data be of acceptable and defensible quality. To meet this requirement, a quality-assurance plan has been developed by the USGS California Water Science Center (CAWSC). The plan includes annual training and review of MWA data-collection techniques, and review of the data before storage in the USGS database. This document summarizes the WY 2011 training and field review component of the quality-assurance plan. Both MWA and USGS agreed that the WY 2011 training and field review would focus primarily on GW measurement and well canvassing techniques.

Training:

On 9/8/11, USGS CAWSC Data Program Water-Quality / Groundwater Technical Specialist Ronald Fay and USGS Data Management Specialist Susie Crowley held a five-hour classroom training session at the MWA facility in Apple Valley, CA. Nine MWA employees attended, and included both technical and computer-support staff. Training included well canvassing methods and proper calibration and collection techniques for groundwater water-level data. Sites chosen for the field review were discussed using guidelines from the newly-released USGS Techniques and Methods document TM1-A1 "Groundwater Technical Procedures of the U.S. Geological Survey" (released April 2011).

On USGS recommendation, MWA recently purchased handheld field computing units (PDAs) to electronically calculate and store groundwater field data. These data are then transferred to the USGS database via the electronic data files produced by the USGS Multi Optional Network Key Entry System (MONKES) program installed on the PDA. This process eliminates paper copies of field notes and greatly reduces transcription time and errors. While at the MWA facility, Susie Crowley installed the MONKES program on the MWA PDAs. She also provided introductory training during the classroom session and during the field review.

Field Review:

During the afternoon of 9/8, and continuing on 9/9, Fay and Crowley accompanied MWA technical staff Anna Garcia, Matt Howard, Ben Christianson, Chris Schutz and Tony Winkel to six USGS well sites that are now routinely measured by MWA. USGS and MWA measuring points (MPs), Land Surface Datum (LSD) and other reference marks (RMs) were inspected. Water-level measuring and well sounding techniques were reviewed. Calibration checks were performed on MWA equipment. Details of each site inspection are listed below.

On 9/8/11, three sites were inspected:

1. Site # 342639117005501 4N/1W-7R1 (Rabbit Dry lake well)-

The well was found to have a 2" threaded coupling welded over a hole in the top of the casing. MWA personnel had installed the coupling on 10/1/2005, to secure the access hole. Following the visit, a new MP was established in GWSI and ending dates were assigned to the older MPs. The MP description below will be seen when using MONKES. During the review, an LSD RM was cut into the side of the casing at the original LSD height.

Existing USGS MPs= 1 inch hole North side of casing, 1.40 ft above LSD (ended 9/8/11)
= Top of casing, east. 1.50 ft above LSD (ended 9/8/11)

Existing MWA MP: top of casing, north side, 0.43 ft above LSD.

A new MP was established on 10/1/2005 by MWA = Saw mark on north side of 2 inch threaded coupling 1.51 ft above LSD (added .11 to USGS MP for length of coupling).

New LSD mark= chiseled "+" mark on East side of casing at original LSD height (1.40 ft blw top of casing).

Recommendations:

From 10/1/2005 to present, all MWA water levels measured from the top of the 2" threaded coupling (new MP = 1.51 ft above LSD) must have 1.51ft subtracted for the correct "depth below LSD" value. Prior to the installation of the 2" coupling on 10/1/2005, all measurements made from the top of the casing must have 1.40 ft subtracted.

2. Site # 342943116555201 5N/1W-25G1 (McDowell Rd. well)-

MWA had welded a cover plate over a hole in the casing for well protection. The cover plate is level with the top of the casing. No change is necessary to the existing MP height. An LSD RM was cut into the side of the casing at the original LSD height.

Existing USGS MP = top of casing, on south side, 2.0 ft above LSD.

Existing MWA MP = top of welded plate at pumpbase, South side, 2.35 ft above LSD.

New LSD mark = chiseled "+" mark on South side of casing at original LSD height (2.00 ft blw top of casing).

Recommendations:

All "Depth below LSD" water levels calculated by MWA using the 2.35 MP height need to be corrected. The correct MP height is 2.00 ft abv LSD.

3. Site # 343417116574501 6N/1W-27R1 (247 Tank well)-

Well was found to have a 2" threaded coupling welded over a hole in the top of the casing. MWA personnel had installed the coupling on 4/20/07 to protect the access hole. A new MP was established, and an LSD RM was cut into the side of the casing at the original LSD height.

Existing USGS MP = top of casing, Northeast side, 1.85 ft above LSD.

Existing MWA MP = top of casing, Northeast side, 1.85 ft above LSD.

New MP established 4/20/07 by MWA = Top of 2" threaded coupling, saw mark, North side, 1.96 ft above LSD (added .11 to USGS MP for length of coupling).

New LSD mark = chiseled "+" mark on Northeast side of casing at original LSD height (1.85 ft blw top of casing)

Recommendations:

Beginning on 4/20/07, all MWA water levels measured from the top of the 2" threaded coupling (new MP = 1.96 ft above LSD) must have 1.96 ft subtracted for the correct "depth below LSD" value. Prior to the installation of the 2" coupling on 4/20/07, all measurements made from the top of the casing must have 1.85 ft subtracted.

On 9/9/11, the last three of six sites were inspected:

4. Site # 342728117053001 4N/2W-4Q1 (Del Oro 16" well)-

Abandoned irrigation well that has partially filled in with sand. Ground surface immediately around well has collapsed several feet, most likely from the underground void created as sand filled into the well during pumping. Well sounded at 401.1 ft blw mp. An LSD RM was cut into the side of the casing at the original LSD height.

Existing USGS MP = Gap under lid on South side of casing, 1.40 ft abv LSD.

Existing MWA MP = top of casing, South side, 1.40 ft above LSD (remove large cover).

New LSD mark = chiseled "+" mark on South side of casing at original LSD height (1.40 ft below top of casing).

Recommendations:

To eliminate having to remove the large casing cover before each measurement, consider drilling an access hole in the top of the cover. Tap the hole for a threaded plug, or weld a threaded coupling over hole as was done on other MWA wells. Then establish the new MP (description and height).

5. Site # 342514117134801 4N/3W- 19G2 – G6 (Rock Springs Rd. well cluster)-

USGS-drilled well cluster. Metal recorder box attached to 16" outer protective casing. Cement pad surface seal found covered with up to one foot of windblown sand. The cement pad was cleared, a new MP was established, and an LSD RM was chiseled into the cement pad at the original LSD height. LSD has not changed since well installation.

Note: the comments and recommendations below pertain to all five wells in the cluster.

Most current existing USGS MP (prior to 9/9/11) = top of shelter, inside edge, 3.56 ft above LSD

Existing MWA MP = top of recorder box, 3.30 ft above LSD.

New MP established 9/9/11 = straight edge across recorder box directly over well, 3.49 ft above LSD (added 1.34 ft to USGS MP for recorder box).

New LSD mark = chiseled “+” mark on cement pad, Southwest side, at original LSD height (2.15 ft blw top of outer casing).

Recommendations:

All MWA water levels measured from the top of the recorder box (new MP = 3.49 ft above LSD) must have 3.49 ft subtracted for the correct “depth below LSD” value.

6. Site # 343631117211001 6N/5W-13G8 (OW-2 well)-

Well is located in the floodplain of the Mojave River. The site is currently in a swamp condition. The water level in the well was measured at .23 ft below the top of the casing, or 3.99 ft above LSD. Employees dug down through heavy vegetation and mud in an attempt to expose the original leveled LSD (described by USGS as 4.22 ft below top of casing). At approximately 3 ft below the top of casing, thick mud and water prevented digging any further. Using existing canvass data and photographs, it was determined that the original 6 inch casing is still the same, with the original MP intact.

Existing USGS MP = top of 6 inch pvc casing, 4.22 ft above LSD.

Recommendations:

After the water level drops in the river, dig down to expose the original LSD. Mark the LSD at 4.22 ft below the top of the 6” PVC casing.

Water-level measuring equipment and techniques:

MWA uses both steel and electric tapes to measure groundwater levels. Tapes have been identified and are calibrated annually against a steel tape designated as the calibration, or ‘reference’ tape. Calibration data are stored in a log book and is current. At well site 4N/2W-4Q1(Del Oro site), a 500 ft “Solinst” brand electric tape identified as “ET-14” was checked against the reviewer’s steel calibration tape. The MWA electric tape was .04 ft different than the USGS steel tape at 248 feet (248.02 ft vs 247.98 ft, respectively). This difference is within the .02% acceptance criteria established by the USGS California Water Science Center. The total well depth was sounded at 401.1 ft. The sounding measurement was checked by the reviewer and was found to be accurate. At all sites reviewed, MWA employees were careful to measure accurately, using standard USGS techniques.

Recommendations:

Continue annual calibration checks on equipment.

Groundwater Water-Quality

Water-quality techniques were discussed during the training session. While water-quality techniques were not reviewed this year, past reviews showed that consistent, defensible techniques were used, with strict adherence to USGS sampling protocols. The reviewer is confident that the same high-quality work continued through WY11.

Recommendations: none

Review summary, comments and recommendations:

Water levels collected by MWA need to be referenced correctly to established and marked Land Surface Datum (LSD). As stated in the USGS TM1-A1 Guidelines, LSD is not changed unless it is destroyed. If MPs change, new MPs must be referenced to the same intact, marked LSD. Without the clear, written guidance that is now available in the USGS TM1-A1 Guidelines document, personnel used their best judgment and changed MP and LSD heights at some wells, because the local land surface around the well had changed. At other wells, MPs were altered without a new MP description and height established.

Reference Marks need to be inspected on all wells measured by MWA, as were done on the six sites during this review. Old MP and LSD heights should continue to be used for reference, provided they haven't been altered or destroyed. Existing LSD Reference Marks need to be located at the site. If a mark doesn't exist, create one by measuring accurately from an old, existing MP. Historical water-level data, determined from incorrect MPs and LSDs, need to be corrected.

Once MP and LSD heights and descriptions are correct in the USGS database (GWSI), field trips can be set up on MWA's hand-held PDAs using the MONKES program.

Please do not hesitate to contact me with questions or comments.

Thank you,
Ronald G. Fay
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(858) 679-4015

UNITED STATES GOVERNMENT
MEMORANDUM

Date: September 14, 2010

Reply to

Attn of: Ronald G. Fay

Subject: Mojave Water Agency water-quality training and field review August 25 – 26, 2010.

To: The record

As part of a cooperative agreement between the U.S. Geological Survey (USGS) and the Mojave Water Agency (MWA), groundwater water-quality data provided by MWA is stored in the USGS National Water Information System (NWIS) database. The USGS requires that the data be of acceptable and defensible quality. To meet this requirement, a quality-assurance plan has been developed by the USGS California Water Science Center (CAWSC). The plan includes training and annual review of MWA sample-collection techniques, review of the contract lab used by MWA to analyze samples, and annual review of the data before storage in the USGS database. This document summarizes WY 2010 training and field review of sampling techniques.

On 8/25/10, USGS CAWSC Data Program Water-Quality Specialist Ronald Fay held a classroom training session with MWA employees Anna Garcia, Matt Howard, Ben Christianson, Chris Schutz, Seth Zielke and Tony Winkel. The training included proper calibration and collection techniques for groundwater water-level and water-quality data. On 8/26/10, Fay reviewed the MWA groundwater equipment cleaning process, followed by the collection of a source-solution blank and an equipment blank. Fay then reviewed MWA groundwater sample-collection and processing techniques at observation well #5N/3W-27E4.

Fay also inspected a newly-fabricated mobile laboratory. The mobile lab consists of a custom-designed water-quality camper lab mounted on a four-wheel-drive truck. During sampling, pumped groundwater is routed directly into the mobile lab, avoiding atmospheric exposure and minimizing water temperature changes. Ben Christianson took the lead in design, procurement and outfitting of the vehicle. Ben is to be commended on his effort.

Review comments and recommendations:

Many of the comments and recommendations below were discussed with MWA personnel during the review. It was clear that recommendations from past reviews have been incorporated into MWA's current standard operating procedures.

Water-level measuring equipment and techniques:

MWA uses both steel and electric tapes to measure groundwater levels. Tapes have been identified and are calibrated annually against a steel tape designated as the calibration, or 'reference' tape. Calibration data is stored in a log book and is current. At the well site, a 500 ft "Waterline" brand electric tape identified as "ET-1" was checked against the reviewer's steel tape. The MWA electric tape was .10 ft different than the USGS steel tape at 162 feet (162.10 ft vs 162.00 ft, respectively). MWA employees were careful to measure accurately from the established measuring point. The reviewer had each employee measure the well using standard USGS technique. The total well depth was sounded. The sounding measurement was checked by the reviewer and was found to be accurate.

Recommendations:

1. The 1000 ft electric tape (ET-12) needs to be sent in to repair a split in the insulation above the probe.
2. Evaluate why the 500 ft electric tape (ET-1) was .10 ft off at 162 ft.

GW sampling equipment and quality-control blank samples:

The MWA GW pump system consists of a Grundfos Redi-Flo2 stainless-steel pump and food-grade polyethylene tubing. The materials are suitable for analysis of targeted inorganic constituents. The tubing is supplied directly from a factory-wrapped supply reel and cut to length as the pump is lowered into the well. It is not cleaned before use. The tubing is discarded after each sample. Sample bottles are supplied pre-cleaned from the TestAmerica lab and are not rinsed with sample water before filling.

As was done in WY08, an equipment blank was collected before sampling, using an entire 500 ft reel of unused tubing. A source-solution blank was also collected to verify the quality of the blank water and sample containers.

The blanks contained small to moderate concentrations of several constituents. Aluminum was detected in the source-solution and equipment blanks (14 and 90 ug/l, respectively). The subsequent environmental sample concentration was below the reporting level of 10 ug/l. While Aluminum contamination in the blanks did not affect the environmental sample at the 10 ug/l reporting level, the source of the contamination needs to be investigated.

Manganese was detected at 1.1ug/l in the equipment blank (reporting level of 1.0 ug/l), but was below the reporting level in the source-solution blank and in the environmental sample. The small concentration in the blank did not affect the environmental sample at the 1.0 ug/l reporting level.

Arsenic, at a reporting level of 1.0 ug/l, was seen in the source-solution blank (2.0 ug/l), the equipment blank (1.4 ug/l) and also in the environmental sample (1.3 ug/l). Arsenic concentrations from two previous environmental samples were below the reporting level. Similar concentrations in all blanks and in the environmental sample suggest process contamination (lab instrument carry-over, bottle contamination, etc). While internal lab QC data and the blank water certification looked fine, lab instrument carry-over from a concentrated sample may be the cause of the contamination.

Recommendations:

1. Investigate the source of the Aluminum contamination in the equipment blank.
2. Flag the 8/26/10 environmental sample's Arsenic value as "affected by contamination". After the data transfer to the USGS database, the arsenic value should have the USGS remark code "V" (Value affected by contamination) assigned to it.
3. Analyze a sample of the Sparkletts Purified water that is used as the final rinse water during the equipment cleaning process. Target the same constituents that are analyzed for environmental samples.

Purging and sampling techniques:

MWA techniques were excellent. The pump was lowered to a depth of 170 ft, which was approximately 10 ft below the water surface and 13 ft above the perforated interval. The pumping period was 35 minutes at 1.1 GPM. Approximately 7.3 casing-volumes of water were removed before sample collection. All monitored field parameters (water level, water temperature, specific conductance, pH, DO and turbidity) reached stability before sample collection. A final set of readings were also taken after sample collection to verify stability during sampling. Pump tubing was attached to a flow meter and to the YSI flow-through chamber during purging. The pump tubing was then disconnected and a small section of tubing removed immediately before collecting the sample from the tubing.

A calibrated YSI #556 multiple-parameter meter with a flow-through cell was used in the mobile lab to monitor Water Temperature, Specific Conductance, pH and DO while purging the well of stagnant water. Turbidity was monitored with a LaMotte #2020 meter. Calibration standards were in date. Calibrations were recorded in a log book. After calibration, the YSI meter was checked by the reviewer using USGS standards and buffers. The meter performed to USGS specifications for all constituents. The YSI barometer differed from the reviewer's calibrated barometer by one mmHg. While the parameters are monitored to verify stability, water temperature is the only field parameter stored in the MWA database.

Recommendations:

1. As noted in prior reviews, please consider including field measurements of pH, SC, DO and Turbidity with the data transferred to the USGS database.

In the reviewer's opinion, MWA personnel once again demonstrated sound, defensible water-quality techniques. Water-quality data collection adhered to USGS protocols. Sampling equipment was acceptable for the types of analyses performed. The sample collected was representative of the target aquifer.

Please do not hesitate to contact me with questions or comments.

Thank you,
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(858)679-4015

UNITED STATES GOVERNMENT
MEMORANDUM

Date: October 29, 2009

Reply to

Attn of: Ronald G. Fay

Subject: Mojave Water Agency annual water-quality training and field review 8/19 – 8/20/09.

To: The record

U.S. Geological Survey (USGS) cooperator, Mojave Water Agency (MWA), has requested to store ground-water water-quality data in the USGS National Water Information System (NWIS) database. The USGS requires that the data be of acceptable and defensible quality. A quality-assurance plan was developed by the USGS California Water Science Center (CAWSC). The plan includes training and annual review of MWA sample collection techniques, review of the contract lab used by MWA to analyze samples, and annual review of the data before storage in the USGS database. This document summarizes WY 2009 training and field review of MWA personnel, as well as addressing the MWA response to the 2008 field review write-up.

For the 2009 training and field review, MWA requested that an emphasis be placed on reviewing sample collection from their Westbay multiple-port groundwater sampling system. A substantial amount of samples have been collected by MWA using the Westbay well system. The number of samples will likely increase as additional Westbay systems are installed.

Annual Training and Field Review

On 8/19/09, USGS CAWSC Data Program water-quality specialist Ronald Fay held a classroom training session with MWA employees Anna Garcia, Ben Christianson, Seth Zielke, Chris Schutz, Matt Howard and Tony Winkel. Matt and Tony are new hires and did not attend the 2008 training. After the classroom session, Fay observed MWA personnel clean and prepare sampling equipment used to collect samples from the Westbay system. After cleaning, quality-control equipment blanks were collected. On 8/20/09, Fay reviewed MWA ground-water sample collection techniques at a nearby Westbay well.

Many of the comments and recommendations below were discussed with MWA personnel during the review. This document will first summarize the MWA response to the 2008 review.

MWA response to the 2008 review:

The reviewer was very impressed with the effort made to address recommendations made in the WY2008 review. For instance, a water-level tape Quality-Assurance (QA) program was developed by MWA to include a system for tape identification and for calibration checks. A tape decontamination procedure was developed. A sampling chamber was fabricated and used during the 2009 review. All other 2008 recommendations were implemented. Great job MWA!

Recommendations:

1. Identify the actual tape on the reel. Tapes are often replaced on the same reel. Suggest adding a “.x” to the tape reel name for the actual tape name (ie- ET-12.1).
2. On the MWA Annual Water Level Tape Calibration form:
 - a) Add the type of tape (steel tape) under “Reference Tape” in the box.
 - b) Add the manufacturer name in the “ET-“ boxes. This may help to identify and explain trends in calibration data.
3. Establish a calibration-acceptance criteria for tapes. Electric tapes may need a different criteria than steel tapes. Compare vendor specs to calibration records. Consider reported water-level accuracy when establishing the criteria.

Water-quality field measurements:

MWA recently purchased a YSI 556 multi-probe system and used it to measure sample water temperature, specific conductance, pH and dissolved oxygen. Turbidity was measured by a separate meter. The YSI 556 system was calibrated and then checked with instruments and standards brought by the reviewer. Water temperature agreed within .03 degree C of the reviewer’s NIST-traceable thermometer. Specific conductance reading agreed within 1.5% compared to unopened USGS standards. Barometric pressure matched the reviewer’s calibrated barometer exactly. Dissolved oxygen was checked against theoretical saturation values, using a wet towel to produce a 100% water-saturated air environment. The meter measured approximately 90% of the theoretical saturation value. Field measurements (water temperature, specific conductance, pH, DO and turbidity) were taken on both the environmental sample and the sequential replicate. Field values were comparable between the environmental sample and the replicate.

Recommendations:

1. Use pH 7 buffer as the first buffer when performing a two or three-point pH calibration. This was verified in the field by a phone call to YSI.
2. Consider storing and reporting field values obtained with calibrated instruments. USGS considers field measurements to be more reliable than lab values. For example, water temp and dissolved oxygen measurements are important field measurements to help explain the sample’s chemistry. Lab measurements of these values will not represent aquifer conditions.

Westbay well construction, sampling equipment and sampling procedure:

The MWA Westbay construction specifications for the zone of interest (in feet below LSD) are as follows: 12 inch borehole, 4 inch well, sand pack from 468 – 500 ft, screen at 480 – 490 ft, sampling port at 482 ft. Assuming a 20% sand-pack porosity, the sand-pack is estimated to contain approximately 17 gallons of water. Sampling equipment consists of a string of four stainless-steel cylinders connected to each other. Each cylinder holds approximately 250 ml, with a total sample volume of 1 liter. Vacuum is produced in the cylinders before lowering the string to the desired depth. The top cylinder is then mechanically pressed to the sampling port, allowing water to enter and fill the string.

Westbay system quality assurance (QA):

The water-bearing zone adjacent to the sampling port is not purged prior to sample collection. The rationale is that, in properly constructed wells, groundwater flows naturally through the borehole and sand pack, eliminating a stagnant water condition. Approved low-flow sampling techniques rely on this assumption. According to the USGS National Field Manual (NFM) Ch. A4, section 4.2.2.B. pg. 95, “Flow dynamics within the well must be understood to determine if and when the water being withdrawn represents fresh formation water”. The reviewer (Fay) participated in a conference call with Westbay representatives and MWA to better understand the Westbay system’s flow dynamics. Historical MWA sample data, collected since well completion, was reviewed by MWA and shown to Fay. A data trend was seen, suggesting that representative conditions had developed over time. Those data considered non-representative were censored from publication by MWA.

Quality-control sampling of the Westbay system was recommended by the reviewer and was done during the review. Blank samples included a source-solution blank, a sample tube (simulated well) blank and a sample-equipment blank, collected in that order. A sequential replicate sample was collected immediately after collecting the environmental sample.

Blanks were collected after cleaning the equipment at the MWA warehouse. Inorganic blank water was provided by the lab that analyzes MWA’s environmental samples. The water was certified to the same reporting level used for the environmental sample analyses. The source-solution blank and tube blank had small concentrations of several metals. These concentrations were inconsequential, since the sampling equipment blank, collected as the last blank in the sequence before collecting the environmental sample, had no detection of these constituents. Only one target analyte, dissolved calcium, showed a detection of 0.52 mg/l in the sample-equipment blank and 0.10 mg/l in the tube blank. The 0.52 mg/l concentration could have a small effect on the environmental sample concentration of 15 mg/l if there was carry-over. The concentration is approximately three percent of the environmental sample concentration and five times the 0.10 mg/l reporting limit. Carry-over from the blank may be ruled out, however, because both the environmental sample and the replicate had exactly the same concentration of calcium. Carry-over from the blank would normally result in a higher concentration in the first sample than in the replicate.

Field measurements and lab data from the sequential replicate compared favorably to the environmental sample. Many constituents matched exactly between the two samples. Lab Specific Conductance of the two samples compared within ~5% (210 vs 200 uS/cm). The favorable sample comparison indicates that the sand-pack water chemistry is relatively homogenous, and that sample collection, processing and analysis were consistent between both samples.

Recommendations:

1. Compare data from nearby wells with screens open to the same zone that a Westbay sampling port is located. Similar water-quality field measurements and analyte concentrations will help to defend that Westbay samples are representative of the aquifer, or zone of interest.

Westbay system sampling techniques:

MWA techniques, once again, were excellent. The crew was methodical and efficient. The 'clean-hands / dirty-hands' technique was used for sample collection and processing. Disposable gloves were worn and were changed frequently. A sampling chamber was used during the disassembly of the Westbay sampling apparatus and subsequent collection and processing of sample water for the equipment blank and for the environmental sample.

Recommendations:

1. Rinse lab sample bottles with a small amount of sample to condition the bottle before filling, unless the lab recommends otherwise (ie- if a sample bottle comes with preservation chemical added beforehand).

MWA personnel continue to demonstrate sound, defensible water-quality techniques. These techniques help to produce data of acceptable quality for storage in the USGS database. Data from quality-control samples provided assurance that the Westbay sampling equipment is acceptable for target analytes measured at their current reporting levels.

Lance Eckhart's staff are to be commended for their performance and work ethic.

Please do not hesitate to contact me with questions or comments.

Thank you,
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Poway, CA 92064
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UNITED STATES GOVERNMENT
MEMORANDUM

Date: April 22, 2008

Reply to

Attn of: Ronald G. Fay

Subject: Mojave Water Agency water-quality training and field review 2/27 - 2/28/08.

To: The record

U.S. Geological Survey (USGS) cooperator, Mojave Water Agency (MWA), has requested to store ground-water water-quality data in the USGS National Water Information System (NWIS) database. In order to approve this request, the USGS requires that the data be of acceptable and defensible quality. A plan was developed by the USGS California Water Science Center (CAWSC) to quality-assure the MWA data. The plan includes training and annual review of MWA sample collection techniques, review of the contract lab that MWA uses to analyze samples, and annual review of the data before storage in the USGS database. This document summarizes WY 2008 training and field review of MWA personnel.

On 2/27/08, USGS CAWSC Data Program water-quality specialist Ronald Fay held a one-day classroom training session with MWA employees Anna Garcia, Ben Christianson, Chris Schutz and Seth Zielke. On 2/28/08, Fay trained MWA personnel to collect a quality-control equipment blank. He then reviewed MWA ground-water sample collection techniques at a nearby observation well (#5N/3W-27E4).

Comments and recommendations:

Water level measuring equipment and technique:

MWA uses a "Waterline" brand electric tape. The tape was checked against the reviewer's steel tape. The MWA electric tape was .03 ft different than the USGS steel tape (162.08 ft vs 162.05 ft, respectively). MWA employees were careful to measure accurately from the established measuring point. The total well depth was sounded. The sounding measurement was checked by the reviewer and was found to be accurate.

Recommendations:

1. Check tape calibration periodically and maintain calibration records. Calibration records are important if water level data is ever questioned.
2. The USGS recommends that WL measuring equipment should be cleaned before use to prevent contamination (see USGS National Field Manual, Ch. 3.3.8). Acceptable procedure consists of a dilute (0.1 – 2%) Liquinox soap solution on a

scrub brush or paper towel, followed by a DI water rinse. Equipment should be disinfected with a dilute bleach solution, or with methanol or ethanol, if biological contamination is suspect. Disinfection should be followed by a DI water rinse.

GW Sampling and monitoring equipment:

The MWA GW pump system consists of a Grundfos Redi-Flo2 stainless-steel pump and food-grade polyethylene tubing. The pump is disassembled and cleaned between wells, immediately before sampling. The tubing is supplied directly from a vendor supply reel and cut to length as the pump is lowered into the well. It is not cleaned before use. The tubing is discarded after each sample. An equipment blank was performed before sampling, using an entire 500 ft reel of unused tubing. The blank data indicated no contamination of target analytes from the pump system. A flow-through monitoring system was used to monitor water temperature, specific conductance, pH and turbidity during pumping. A Horiba U-10 multi-parameter meter was calibrated before use. After calibration, the meter was checked by the reviewer using USGS standards and buffers. The meter performed well for all constituents other than pH. In a pH 7 buffer (pH = 7.02 at 21degrees C), the meter read 6.85. No drift was observed. MWA personnel indicated that the pH probe was not functioning well and would be repaired. While the parameters are monitored to verify stability, water temperature is the only field parameter stored in the MWA database.

Recommendations:

1. Keep the water-quality meter shaded from direct sunlight during calibration and measurements.
2. Immediately after use, rinse the pump with DI water. Remove the rinse water and bag the pump for storage until it is disassembled and cleaned.
3. Use small diameter (2-4") wash and rinse tubes instead of 5-gallon buckets, to reduce the amount of water needed for the cleaning process. A clean, 2" PVC tube should be used for collection of blank samples.
4. Disposable gloves should be worn whenever handling equipment that comes into contact with sample water.

Purging and sampling techniques:

MWA techniques were excellent. The crew was methodical and efficient. The pump was lowered to a depth of 181 ft, which was 20 ft below the water surface and 3 ft above the perforated interval. Purge-volume calculations were done correctly. The pumping period was 35 minutes at 0.9 GPM. Approximately 8 casing-volumes of water were removed before sample collection. All monitored field parameters (water level, water temperature, specific conductance, pH and turbidity) reached stability. A final set of readings were also taken after sample collection to verify stability during sampling. Pump tubing was attached to a brass hose-barb fitting during purging. The tubing was disconnected from

the hose barb immediately before sample collection. A small section of tubing was then removed to eliminate contamination from the hose barb.

Recommendations:

1. Use an enclosed, non-metallic chamber when collecting samples to prevent atmospheric contamination from the windy, dusty conditions often encountered in the desert. A 16" PVC-frame chamber was shown and fabrication instructions were given to MWA personnel. Disposable, clear, 17" x 23" x 46" plastic bags are clipped to the frame using plastic clothes-hanger clips. The USGS Apple Valley Field Office stocks the bags and will provide them to MWA.
2. Consider a non-metallic hose barb as a replacement for the brass barb, to further reduce the possibility of metals contamination.

In the reviewer's opinion, MWA personnel demonstrated sound, defensible water-quality techniques. Sampling equipment was acceptable for the types of analyses performed. Data from equipment blank samples collected during the review indicated no leaching of target analytes from the pump system. The water-quality data collected by MWA is of defensible quality and is representative of the aquifer sampled. Anna and her staff are to be commended on their work.

Please do not hesitate to contact me with questions or comments.

Thank you,
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